

Wave Ball Mill™ for Roughing WBMR Type

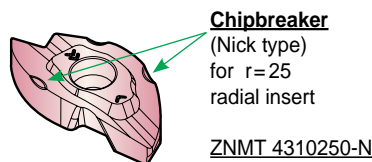


■ Features

Particularly suitable for die mold machining the WBMR replaceable insert ball nose endmill efficiently roughs complex profiles.

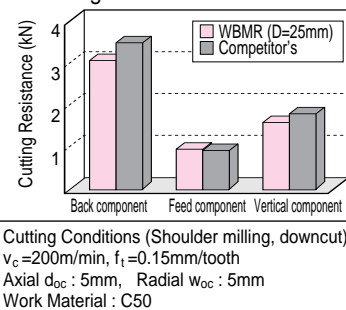
Its high feed rate capability is a direct result of a sharp cutting edge which is maintained during the cutting cycle by the special cemented carbide substrate working in parallel with the ultra hard ZX coating.

- Advantages
 - Wave shaped cutting edge
 - Economical M class insert
 - Precise clamping
 - High feed rate capability

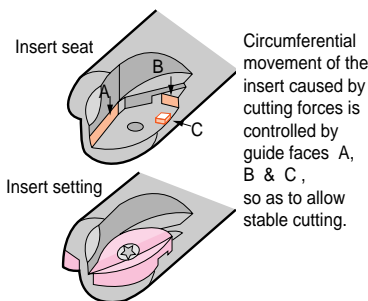


■ Performance

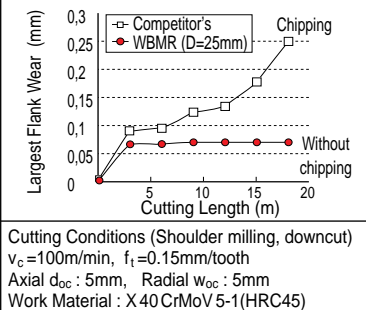
● Cutting Resistance



● Anti-Rotational Mechanism



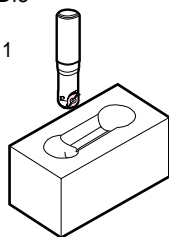
● Insert Life



■ Application Example

● Cold Molding Die

Work Material :
X 155CrVMo 12 1



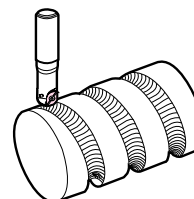
<Results>
Flank wear after continuous cutting for seven hours was less than other manufacturer's product. Stable cutting was observed.

WBMR 2200S ($\phi 20 \text{ mm}$)
Insert Grade : ACZ350

Cutting Conditions :
 $n = 2200 \text{ rpm}$, $v_f = 500 \text{ mm/min}$
Depth of Cut : 0.3~2 mm
Non-water soluble cutting oil

● Injection Molded Part

(Cr-Mo steel + Stellite-overlay)



<Results>
Wave ball ($\phi 30 \text{ mm}$) could cut without chattering while other manufacturer's products could not cut at all due to chattering.

WBMR 2300M ($\phi 30 \text{ mm}$)
Insert Grade : ACZ350

Cutting Conditions :
 $n = 500 \text{ rpm}$, $v_f = 35 \text{ mm/min}$
Depth of Cut : 5 mm
Dry cut

■ Recommended Cutting Conditions

(2 teeth)

Material	Carbon steel (Below HRC25)	Alloy steel (Below HRC45)	Stainless, Die steel etc.	Cast iron
(A) v_c	200-250-300	100-150-200	50-80-100	100-120-150
f_t	0.1-0.2-0.3	0.1-0.2-0.3	0.1-0.15-0.2	0.2-0.3-0.4

[$v_c = \text{m/min}$, $f_t = \text{mm/tooth}$] [min. - optimum - max.]

■ Recommended Cutting Conditions

(4 teeth)

Material	Carbon steel (Below HRC25)	Alloy steel (Below HRC45)	Stainless, Die steel etc.	Cast iron
(A) v_c	200-250-300	100-150-200	50-80-100	100-120-150
f_t	0.1-0.2-0.3	0.1-0.2-0.3	0.1-0.15-0.2	0.2-0.3-0.4
(B) v_c	160-200-240	80-120-160	40-60-80	80-100-120
f_t	0.1-0.2-0.3	0.1-0.2-0.3	0.1-0.15-0.2	0.2-0.3-0.4

[$v_c = \text{m/min}$, $f_t = \text{mm/tooth}$] [min. - optimum - max.]